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13. The orderly arrangement of the several layers and their elementary parts is maintained by a frame of connective tissue which consists of—1, an unbroken homogeneous membrane bounding the inner surface of the retina, the *membrana limitans interna*; 2, a fenestrated membrane which holds the rods and cone-bodies, the *membrana limitans externa*, first correctly described by Schultze; 3, an intermediate system of tie-fibres—Müller's radial fibres—connected with which in the layer of inner granules are certain oblong and fusiform bodies of uncertain nature; 4, the intergranular layer; 5, an areolated tissue, open in the layers of outer and inner granules, and very closely woven in the granular layer.

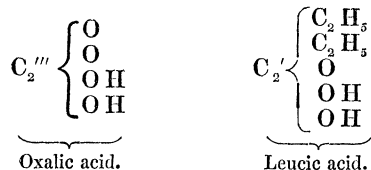
14. No blood-vessels occur in the reptilian retina.

II. "Notes of Researches on the Acids of the Lactic Series.—No. I. Action of Zinc upon a mixture of the Iodide and Oxalate of Methyl."

By E. FRANKLAND, F.R.S., Professor of Chemistry, Royal Institution, and B. F. DUPPA, Esq. Received February 10, 1864.

In a former communication by one of us*, a process was described by which leucic acid was obtained synthetically by the substitution of one atom of oxygen in oxalic acid by two atoms of ethyl.

The relations of these acids to each other will be seen from the following formulæ†:—



This substitution of ethyl for oxygen was effected by acting upon oxalic ether with zincethyl. On distilling the product with water, leucic ether came over, which on treatment with an alkali yielded a salt of leucic acid.

We have since found that this process may be much simplified by generating the zincethyl during the reaction, which is effected by heating a mixture of amalgamated zinc, iodide of ethyl, and oxalic ether in equivalent proportions to the necessary temperature.

The operation may be considered complete when the mixture has solidified to a resinous-looking mass. This, treated with water as in the former reaction and distilled, produces quantities of leucic ether considerably greater than can be obtained from the same materials by the first mode of operating. Thus the necessity for the production of zincethyl is entirely obviated, the whole operation proceeds at the ordinary atmospheric pressure, and a larger product is obtained.

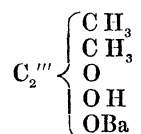
We find that this process is also applicable to the homologous reactions with the oxalates and iodides of methyl and amyl. By it we have obtained

* Proceedings of the Royal Society, vol. xii. p. 396.

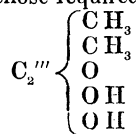
† The atomic weights used in this paper are the following:—C=12, O=16 and Zn=65.

numerous other acids belonging to the lactic series, which we have already more or less perfectly studied, and the history of which we propose to lay before the Royal Society as our researches proceed, reserving for a later communication our views regarding the constitution of this series of acids, and the theoretical conclusions arrived at in the course of the inquiry. In the present communication we will describe the application of this reaction to a mixture of iodide of methyl and oxalate of methyl.

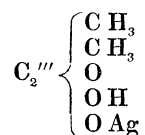
Two equivalents of iodide of methyl were mixed with one of oxalate of methyl, and placed in contact with an excess of amalgamated and granulated zinc in a flask, to which an inverted Liebig's condenser, provided with a mercurial safety tube, was attached. The flask was immersed during about twenty-four hours in water maintained at a temperature gradually rising from 70° C. to 100° C. as the reaction progressed towards completion. At the end of that time the mixture had solidified to a yellowish gummy mass, which, on distillation with water, yielded methylic alcohol possessing an ethereal odour, but from which we could extract no ether. The residual magma in the flask, consisting of iodide of zinc, oxalate of zinc, and the zinc-salt of a new acid, was separated from the metallic zinc by washing with water. It was then treated with an excess of hydrate of baryta and boiled for a considerable time; carbonic acid was afterwards passed through the liquid until, on again boiling, the excess of baryta was completely removed. To the filtered solution recently precipitated oxide of silver was added until all iodine was removed. The solution separated from the iodide of silver was again submitted to a current of carbonic acid, boiled, and filtered. The resulting liquid, on being evaporated in the water-bath, yielded a salt crystallizing in brilliant needles possessing the peculiar odour of fresh butter. This salt is very soluble in water and in alcohol, but nearly insoluble in ether, and perfectly neutral to test-papers. On being submitted to analysis, it gave numbers closely corresponding with the formula



The acid of this salt, for which we provisionally propose the name *dimethoxalic acid*, is obtained by adding dilute sulphuric acid to the concentrated solution of the baryta-salt and agitating with ether. On allowing the ether to evaporate spontaneously, prismatic crystals of considerable size make their appearance. These yielded, on combustion with oxide of copper, results nearly identical with those required by the formula



Dimethoxalic acid is a white solid, readily crystallizing in beautiful prisms resembling oxalic acid. It fuses at $75^{\circ}7$ C., volatilizes slowly even at common temperatures, and readily sublimes at 50° C., being deposited upon a cool surface in magnificent prisms. It boils at about 212° C., and distils unchanged. Dimethoxalic acid reacts strongly acid, and unites with bases, forming a numerous class of salts, several of which are crystalline. In addition to the baryta-salt above mentioned, we have examined the silver-salt, which is best formed by adding oxide of silver to the free acid, heating to boiling, and filtering, when the salt is deposited in star-like masses of nacreous scales as the solution cools. On analysis, this salt gave numbers closely corresponding with those calculated from the formula



Attempts to produce an ether by digesting the free acid with absolute alcohol at a temperature gradually raised to 160° C. proved abortive, traces only of the ether being apparently formed.

Thus the final result of the action of zinc upon a mixture of iodide and oxalate of methyl is perfectly homologous with that obtained by the action of zincethyl upon oxalic ether. In the methylic reaction, however, no compound corresponding to leucic ether was obtained. This cannot create surprise when it is remembered that dimethoxalic ether approaches closely in composition to lactic ether, which is well known to be instantly decomposed by water. We have sought in vain to obviate this decomposition of dimethoxalic ether by adding absolute alcohol in place of water to the product of the reaction.

February 25, 1864.

Major-General SABINE, President, in the Chair.

- I. "On the Joint Systems of Ireland and Cornwall, and their Mechanical Origin." By the Rev. SAMUEL HAUGHTON, M.D., F.R.S., Fellow of Trinity College, Dublin. Received February 8, 1864.

(Abstract.)

This paper is a continuation of a former paper "On the Joints of the Old Red Sandstone of the Co. Waterford," published in the 'Philosophical Transactions' for 1858, and contains the results of the author's observations for some years, in Donegal, the Mourne and Newry Mountains, Cornwall, and Fermanagh, with deductions from theory.

The author establishes the existence in Waterford of a Primary Conjugate System of Joints, and of two Secondary Conjugate Systems, lying at each side of the Primary at angles of $27^{\circ}5'$ and $37^{\circ}11'$.